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ABSTRACTS

vegetatively by grafting or cuttings. The aim of this study was to propagate in vitro clonal propagation of two chestnut rootstocks. Three different types of explants were cultured (meristem, shoot tips 4–6 mm long, and nodal segments one axillary buds 10–15 mm) in theree different medium which namely MS (1962), WPM and DKW (1984). Every 4 weeks microshoots were transferred fresh media regularly for multiplication.

The phenolic contents and contaminaton of two chestnut rootstocks (*Castanea sativa* Mill.) *in-vitro*-cultivated created big problem in establisment stages. Vitrification was the most important problem in multiplication stage.

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Biological Control of *Phytophthora cinnamomi* Root Rot of Chestnut (*Castanea sativa*) Seedlings Using Several Bacterial Isolates from Chestnut Orchards Soils

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The Natural Park "Aracena y Picos de Aroche" is one of the biggest forest areas in the Southwest of Spain. In this area the sweet chestnut (*Castanea sativa* Mill.) is an ecologically important tree with a long cultural tradition but their preservation is seriously threatened because of the low profit. Even more during the last time a general decline in chestnut cultivation has been observed due in part to the problems with diseases. *Phytophthora cinnamomi* is the casual agent of ink disease, one of the major chestnut fungal diseases, and is present in most of the chestnut growing areas. Chemical treatment is debated, however, in orchards it is not economical and in forest prohibited by most European countries because of environmental hazard. Biological control could be an important tool for controlling ink disease. In this context two hundred bacterial strains isolated from a chestnut forest soil have been assayed against two *P. cinnamomi* strains (Pc1 and Pc9) isolated from the same area. At least five of these bacterial isolates were able to inhibit both phytopathogen strains growth in controlled conditions.

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Carbon and Nutrient Inputs by Litterfall into Three Chestnut High Forest Stands in North Portugal

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The litterfall in three high forest chestnut stands, located in different soil types, in Bornes, Marão and Padrela, north of Portugal, with 45, 63 and 65 years old, respectively, was collected during two years in December by a quadrate method with 0.5*0.5m. To the sampling of the presented study there were collected four kinds of samples – (1) leaf litter constituted by vegetal materials resulting from the litterfall of the year; (2) leaf litter constituted by a mixture of vegetal materials in different decomposition stages; (3) soil from 0-5 cm depth and (4) soil from 5-10 cm depth. The litter of the year was separated into the fractions leaves, branches, fruits and fruit cases. The fractions were dried at 70ºC, weighted and the concentrations of N, P, K, Ca, Mg, S, B e C were measured. The total amount of litter in the three chestnut stands was 8.3, 7.7 and 12.4 Mg ha^{-1}, respectively. Leaves are the main constituents of the total litter with 54, 62 and 50 %, respectively. The proportion of the other litter fractions varies between 10 and 19 % for the hedgehogs, 20 and 32 % for the branches and 4 and 10 % for the fruits. Regarding the concentration of the nutrients in the litter fractions, in general, leaves are rich in N>Ca>Mg>K>P>S; fruits are rich in N>K>Mg>Ca>P>S. In branches, the N and Ca concentration dominate by far and the fruit cases are rich in N and K. The return of nutrients by litterfall is relevant: it varies between 57 and 141.6 kg ha^{-1} $year^{-1}$ for N, 5 and 10 kg ha^{-1} $year^{-1}$ for P, 13 and 45 kg ha^{-1} $year^{-1}$ for K, 28 and 65 kg ha^{-1} $year^{-1}$ for Ca, 18 and 34 kg ha^{-1} $year^{-1}$ for Mg, 2 and 8 kg ha^{-1} $year^{-1}$ for S, 87 and 117 g ha^{-1} $year^{-1}$ for B. The carbon in the litterfall varies between 4 and 6.3 Mg ha^{-1} $year^{-1}$. It was verified that the biomass nutrients concentrations is strongly dependent of the soil like suggest some authors.